

The impact of climate change in Africa

INTRODUCTION

Climate change has been identified as a leading human and environmental crisis of the 21st century. The problem of understanding climate change (or global warming) is one of the major challenges confronting African people, their governments and the African Union (AU). Moreover, it has been argued that climate change leads to acute conflicts and it therefore becomes imperative to achieve a proper understanding of the phenomenon in Africa. Great public, political and academic attention is now being devoted to the issue of global warming and climate change. A broad scientific and political consensus has been established that climate change poses a considerable threat to Africa, its ecosystems and many of its species: "The science has become more irrevocable than ever: climate change is happening. The evidence is all around us. And unless we act, we will see catastrophic consequences including rising sea-levels, droughts and famine, and the loss of up to a third of the world's plant and animal species."¹ A large number of reports and public statements have also suggested that climate change in Africa is a security threat.²

Concern over the negative impact of climate change has strengthened fears that environmental degradation and demographic pressures will displace millions of people in Africa and create serious social upheaval. Most scientists studying the potential impact of climate change have predicted that Africa is likely to experience higher temperatures, rising sea levels, changing rainfall patterns and increased climate variability, all of which could affect much of its population.

The actual and potential impacts of climate change in Africa are large and wide ranging, affecting many aspects of people's everyday lives. Many climate models predict negative impacts of climate change on agricultural production and food security in large parts of sub-Saharan Africa (SSA).³ Higher temperatures, the drying up of soils, increased pest and disease pressure, shifts in suitable areas for growing crops and livestock, increased

desertification in the Sahara region, floods, deforestation, and erosion are all signs that climate change is already happening and represents one of the greatest environmental, social and economic threats facing Africa: "The impact of climate change will fall disproportionate on the world's poorest countries, many of them here in Africa. Poor people already live on the front lines of pollution, disaster, and degradation of resources and land. For them, adaptation is a matter of sheer survival."⁴

Unfortunately, despite growing concern, no exact and reliable figures are available to quantify the economic costs of the negative impacts of climate change in Africa for either individuals or society as a whole. As far as development is concerned, climate change will have a strong impact on Africa's ability to achieve the Millennium Development Goals (MDGs) and on its development policies in general, with increased pressure on agriculture, water supply and demand, health, and political stability.

This paper is concerned with the fact that African nations are among the lightest polluters, but analysts say they will suffer the most from climate change in their pursuit of water and food security, sustainable development, and political and economic sustainability. Therefore, the paper reviews the relationships among climate change, water and food security, conflicts, and development. It also argues that there is a need for climate change information in Africa and reviews the status of international climate agreements related to adaptation, mitigation and compensation. In addition, the paper argues that even if climate change by its nature may not necessarily lead to violent inter-state conflicts, scarcity of water and food in Africa has, however, already nurtured political tensions among nations, thus retarding efforts towards sustainable development.

The paper is divided into five parts: it begins with a discussion of the need for climate information, followed by sections on the impact of climate change on Africa's water resources, the continent's food security, Africa's development challenges due to climate change, security

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threats facing the continent, and the AU position on climate change. The paper concludes with recommendations and a suggested way forward.

Any attempt to understand the impacts of climate change on Africa is fraught with difficulties. While some of the impacts are known and relatively well understood, there is still great uncertainty about the key climate processes and their consequences. Climate change is already having substantial impacts on Africa. Successfully adapting to these impacts is crucial to achieving the continent's development objectives. Both observational records and climate projections provide strong evidence that freshwater resources in particular are vulnerable and have the potential to be strongly affected, leading to additional pressure on water availability, accessibility, supply and demand in Africa.⁵

THE NEED FOR CLIMATE INFORMATION

There is no internationally agreed definition of the term 'climate change', which has resulted in differences of opinion on the issue. Climate change can refer to long-term changes in average weather conditions covering all changes in the climate system, including the drivers of change, the changes themselves and their effects; or can refer only to human-induced change in the climate system. There is also no agreement on how to define the term 'climate variability'.⁶ Climate has been in a constant state of change throughout the earth's 4.5-billion-year history, but most of these changes occur on astronomical or geological time scales, and are too slow to be observed on a human scale.⁷

On the other hand, it is known that the climate system is highly complex and consists of:

- The atmosphere: gaseous matter above the earth's surface
- The hydrosphere: liquid on or below the earth's surface
- The cryosphere: snow and ice on or below the earth's surface
- The lithosphere: earth's land surface (e.g. rock, soil and sediment)
- The biosphere: earth's plants and animal life, including humans⁸

There is still much to understand about the African climate, its drivers and the links to global warming. Despite considerable progress in African meteorological science, we are still not confident about the major climate trends either at the continental level or for individual countries. Most analyses of the impact of climate change that have influenced United Nations Framework Convention on Climate Change (UNFCCC) agreements

focus on medium- to long-term projections of carbon emissions and forecasting models of global warming, and cover mainly countries and regions for which relevant data is readily available. This leaves out most countries and regions within Africa due to unavailable data and trajectories. Knowledge and access to information are essential for effective environmental management and have significant impacts on the economy and the livelihood choices people make.

If governments are to make informed and transformative choices concerning climate change, they require the best and most up-to-date science. Climate information exists that could improve decision making within these sectors, thereby mitigating the effects of adverse climate. But at present this information is seldom incorporated in policy formulation processes and development decisions. A recent study by the International Research Institute for Climate and Society (IRI) found gaps in four main areas:

- Integrating climate into policy
- Integrating climate into practice
- Climate services
- Climate data⁹

IRI concluded that a major, continent-wide effort to integrate climate risk management into climate-sensitive development processes at all levels is an urgent and top priority requirement for Africa today.¹⁰ Moreover, during the IRI study, problems were also identified in terms of a lack of evidence regarding both the impact of climate variability on climate-sensitive development outcomes and the benefits of climate information to improve these outcomes.¹¹ Raising awareness of climate information and providing evidence of its value to decision makers in climate-sensitive sectors are thus important challenges that must be met.

In the field of climate change, there is still much uncertainty about the probabilities of various possible changes occurring in specific locations. This can be dealt with by investing in improved information to reduce the degree of local uncertainty or by spreading the uncertain risk through some form of global network. Knowledge about the future will always be uncertain, but the current high degree of uncertainty about the potential local impacts of climate change could be reduced through improving the science. Other priorities include recognising the need for decision making in the face of uncertainty, and bridging the gap between scientific and traditional perceptions of climate change.

Climate information

There are three types of climate information:

- Historical data, which helps to elucidate trends, provides climate statistics, sets a context for current data, and allows variability and the occurrence of extremes to be quantified
- Real-time data, i.e. current climate observations, which aids short-term predictions of the consequences of specific weather events, e.g. heavy rainfall leading to flooding
- Climate forecasts, i.e. predictions of the climate, ranging from long-term weather forecasts, through seasonal forecasts, to medium-term (10–30 years) and long-term climate change projections¹²

Most of the sectors on which development efforts focus are climate sensitive, including agriculture, health, energy, transport and water resources. Incorporating climate knowledge into these efforts could greatly enhance their effectiveness, yet the opportunities for doing this are largely being missed in Africa. It is becoming clear that what is needed is an integrated approach that incorporates climate science into multidisciplinary development planning and projects. The climate tools used in such an approach will enhance stakeholders' decisions making by providing relevant new information that they can incorporate into practice. Climate is affecting development in Africa. Strengthening livelihoods by improving agricultural productivity, diversifying on- and off-farm activities, providing better access to markets and market information, and improving infrastructure

will reduce poor people's vulnerability to climate variability and extremes.

THE IMPACT OF CLIMATE CHANGE ON AFRICA'S WATER RESOURCES

Water resources in particular comprise one sector that is highly dependent on and influenced by climate change. A number of countries in Africa already experience considerable water stress as a result of insufficient and unreliable rainfall that changes rainfall patterns or causes flooding. Climate change is real, and its impact is already being felt. It has affected the people of Africa and its food systems that are already vulnerable. The population in SSA is expected to increase from 700 million in 2007 to 1 100 million in 2030 and 1 500 million by 2050, and populations will become increasingly urban.¹³ Overall water demand can therefore be expected to more than double in the first half of the 21st century, without considering rises in per capita demand for food and water.

Agriculture, which provides a livelihood for about three-quarters of Africa's population, is mainly rain fed. Severe and prolonged droughts, flooding, and loss of arable land due to desertification and soil erosion are reducing agricultural yields and causing crop failure and loss of livestock, which endanger rural and pastoralist populations. The Horn of Africa's pastoralist areas (Ethiopia-Kenya-Somalia border) have been severely impacted by recurrent droughts.¹⁴

Table 1 Summary of climate change impacts in Africa by 2009

Factor affected	Low-warming scenario	Mid-warming scenario	High-warming scenario
CO ₂ atmospheric levels in parts per million (ppm)	600 ppm	850 ppm	1 550 ppm
Global temperature increase	1,8° C	2,8° C	4,0° C
Global sea level rise	0,18–0,38 m	0,21–0,48 m	0,26–0,59 m
Water	20–30% decrease in water availability in vulnerable areas	■ Precipitation in sub-tropical areas falls by up to 20% ■ Annual mean rainfall increases by 7% in East Africa ■ Precipitation decrease of 20% along Mediterranean coast	30–50% decline in water availability in Southern Africa
Agriculture and food	5–10% decline in African crop yields	550 million additional people at risk of hunger	Decrease of 15–35% in agricultural yields across continent
Extreme events	Up to 10 million more people affected by coastal flooding globally	■ Coastal flooding affects between 11 and 170 million additional people per year globally ■ 10–20% increase in cyclone activity in the southern Indian Ocean	■ 420 million people exposed to flooding globally ■ Tens of millions displaced by extreme weather events and climate processes

Source Adapted from Oli Brown et al (eds), *Climate change and security in Africa*, Nordic African Ministers of Foreign Affairs Forum, 2009, http://www.iisd.org/pdf/2009/climate_change_security_africa.pdf (accessed August 2010)

In contrast to the lack of knowledge on the direction and magnitude of hydrological changes under different climate change scenarios, the prospects of demographic change in the 21st century because of the continent's overdependence on rain-fed agriculture, compounded by factors such as widespread poverty and weak capacity, are strong. The main longer-term impacts of climate change in Africa include changing rainfall patterns affecting agriculture and reducing food security; worsening water security; decreasing fish resources in large lakes due to rising temperatures and overfishing; rising sea levels affecting low-lying coastal areas with large populations; and rising water stress.¹⁵ Therefore, increasing water availability and increasing the reliability of water in agriculture, i.e. through irrigation, is one of the preferred options to increase productivity and contribute to poverty reduction.

CLIMATE CHANGE AND FOOD SECURITY IN AFRICA

The United Nations Development Programme warns that the progress in human development achieved over the last decade may be slowed down or even reversed by climate change, as new threats emerge to water and food security, agricultural production and access, and nutrition and public health. The impacts of climate change – sea-level rise, droughts, heat waves, floods and rainfall variation – could by 2080 push another 600 million people into malnutrition and increase the number of people facing water scarcity by 1.8 billion.¹⁶ A variety of climate and non-climatic processes influence flood processes, resulting in river floods, flash floods, urban floods, sewer floods, glacial lake outburst floods and coastal floods. Heavy precipitation events are projected to become more frequent in most regions throughout the

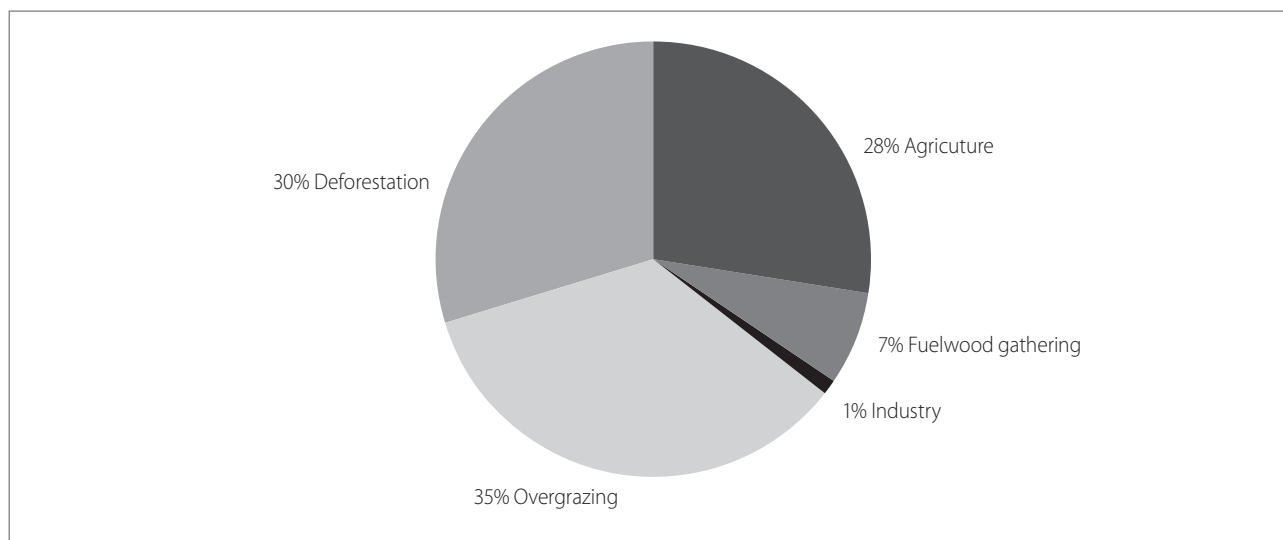
21st century. This would affect the risk of flash flooding and urban flooding.

Until recently, most assessments of the impact of climate change on food and agriculture sector have focused on the implications for food production and global supply food, with less consideration of other components of the food chain. In recent years, world food prices have skyrocketed, causing severe hardship for poor and vulnerable people throughout the world, and in particular in Africa. Between 2005 and 2008 world prices of rice, wheat and maize doubled, pushing more than 100 million people into poverty, including nearly 30 million people in Africa.¹⁷ The causes of the food price crisis in Africa remained land degradation through outdated farming practices, inadequate power generation capacity and distribution networks, poor-quality roads and port facilities, and lack of water storage and irrigation capacity that limited the development of agriculture, imperiled food security and held back trade in agriculture-based products.

Policy debates on the food crisis, such as the UN Food and Agriculture Organisation Food Summit in June 2008, failed to identify the role of sustainable land management in ensuring food security. Nevertheless, land degradation is one of the important long-term factors affecting people's vulnerability to weather extremes. Land degradation is also considered as one of the greatest environmental challenges facing Africa today and is a major impediment to meeting basic human needs.¹⁸ According to the recent Global Assessment of Land Degradation, nearly a quarter of the land surface of the world degraded between 1981 and 2003.¹⁹

Land degradation is also a result of poverty (e.g. cutting trees for farm land and energy), due to population pressure and lack of structural transformation of the

Figure 1 Human activities causing soil degradation



Source Erosion, Wikipedia, <http://en.wikipedia.org/wiki/Erosion> (accessed 29 July 2010)

economies in rural areas. Figure 1 shows human activities that cause soil degradation.

Severe and prolonged droughts, flooding, loss of arable land due to deforestation, overgrazing and fuel-wood gathering that has led to soil degradation are reducing agricultural yields and causing crop failures and loss of livestock, which endangers rural and pastoralist populations. The Horn of Africa's pastoralist areas (Ethiopia-Kenya-Somalia border) have been severely hit by recurrent droughts, causing livestock losses that have plunged approximately 11 million people who are dependent on livestock for their livelihoods into crisis and triggering the mass migration of pastoralists out of drought-affected areas.²⁰

Definitions of food security identify the outcomes of food security and are useful for formulating policies and deciding on actions, but the processes that lead to the desired outcomes also matter. Climate change is affecting all four dimensions of food security in Africa, i.e. food availability, food accessibility, food utilisation and food systems stability, each of which is discussed in more detail below. It will also have an impact on food production and distribution channels, as well as changing purchasing power and market flows. Its impacts will be both short term, resulting from more frequent and more intense extreme weather events, and long term, caused by changing temperature and precipitation patterns.²¹

Recent work describing the functioning of food systems has helped to show both desired food security goals and what needs to happen to achieve them.²² Agriculture is important for food security both in terms of producing food that people eat and providing the primary source of livelihood for over 80 per cent of Africa's total workforce. If agricultural production in the low-income developing countries is affected severely by climate change, the numbers of rural poor people that will be put at risk due to vulnerability to food insecurity will surge.

Food availability

Food availability is determined by the physical quantities of food that are produced, stored, processed, distributed and exchanged. Food availability is also measured in terms of the net amount remaining after production, stocks and imports have been summed and exports deducted for each item included in the food balance sheet. Adequacy is assessed through the comparison of availability with the estimated consumption requirement for each food item.²³ This approach takes into account the importance of international trade and domestic production in assuring a country's food supply, with domestic markets playing the balancing role.

Food accessibility

Food accessibility is a measure of the ability to secure entitlements, which are defined as the set of resources (legal, political, economic and social) that an individual requires to obtain access to food.²⁴ Until the 1970s food security was linked mainly to national food production and global trade, but since then the concept has expanded to include households' and individuals' access to food.

Food utilisation

Food utilisation refers to the use of food and how a person is able to secure essential nutrients from the food he/she consumes. It encompasses the nutritional values of an individual's diet, including its composition and methods of preparation, and the social values of particular foods, which dictate what kinds of food should be served and eaten at different times of the year and on different occasions. It also refers to the quality and safety of the food supply, which, if not of a sufficient standard, can cause loss of nutrients in the food spread or food-borne diseases.²⁵ Climate conditions are likely to bring both negative and positive changes in dietary patterns and new challenges for food safety, which may affect nutritional status in various ways.

The adverse impact of climate change on food utilisation is significant. Declines in the availability of wild foods and limits on small-scale horticultural production due to the scarcity of water or labour resulting from climate change could affect food utilisation. Climate change will also cause new patterns of pests and diseases to emerge, affecting plants and human health. In addition, increased incidence of water-borne diseases in flood-prone areas, changes in vectors for climate-responsive pests and diseases, and the emergence of new diseases could affect both the food chain and people's physiological capacity to obtain the necessary nutrients from the foods they consume.

Food system stability

Other food system processes, such as processing, distribution, acquisition, preparation and consumption, are as important for food security as food and agricultural production.²⁶ Technological advances and the development of long-distance marketing chains that move produced and packaged foods throughout Africa at high speed and relatively low cost will make overall food system performance far less dependent on climate.

Ensuring food security in the context of climate and growing risks due to disasters is one of the greatest adaptation challenges. Agriculture, forestry and fisheries

will not only be affected by climate change, but will also contribute to it through emitting greenhouse gases. The MDG of halving the number of undernourished people by 2015 is becoming more difficult to reach as a result of the adverse impact of climate change.²⁷ Africa's food security situation is particularly worrisome. Of the 36 countries worldwide currently identified as food insecure, 21 are in Africa.²⁸

The impact of food security in Africa is two-fold: firstly, the failure of export crops such as cocoa, flowers or coffee causes trade imbalances that greatly restrict African access to international agricultural markets; and, secondly, subsistence agriculture becomes less capable of catering to local demands for food, particularly as populations increase. Moreover, advanced agricultural producers can adapt quickly to the impact of climate change, producing new crops that may crowd out African exports to developed nations.

Sustainable land management can play an important role in helping to mitigate the impacts of rising world food prices on poor people in Africa. Although the potential for the adoption of improved land management approaches has increased as a result of rising food prices, achieving this potential will require identifying and addressing the key constraints that limit the adaptation of sustainable land management practices where they are profitable. The extent of agricultural expansion and the damage caused can be limited by well-implemented land-use policies and planning, with local resource users given a major role in developing and implementing such plans and an economic stake in preserving resources that provide valuable services.

The prevailing paradigm among development assistance agencies focuses on the alleviation of poverty, recognising that the benefits of macroeconomic growth have largely bypassed the majority of households, especially in rural Africa.²⁹ In addition, climate variability and change can contribute to land degradation by exposing unprotected soil to more extreme conditions.³⁰

CLIMATE CHANGE – AN AFRICAN DEVELOPMENT CHALLENGE

Economics is generally defined as the study and process of producing, distributing (or exchanging), and consuming goods and services. Such a definition, however, in part hides the fact of how economics penetrates every aspect of social life. Whether one talks of poverty, income, jobs, housing, class, education, religion, the arts or social status, all at one level imply and necessitate a concern with economics.³¹ Even the major current ideologies and social systems that compete for the minds of peoples, i.e. capitalism, socialism, nationalism, democracy, etc., have been shaped in significant part by

important economists of the past, e.g. Adam Smith, Karl Marx, John Maynard Keynes, etc.³²

Very large and sustained increases in growth are necessary if SSA is to have a realistic prospect of halving income poverty by 2015. To meet the poverty MDGs,³³ SSA's real gross domestic product growth rates will have to double from a base scenario to about 7.5 per cent.³⁴ Africa has responded to the challenges posed to sustainable development by committing itself to and designing policies for creating an enabling environment for growth at the regional, sub-regional, national and local levels. These policies are designed to support sustained economic growth; environmental integrity; efforts for peace, stability and security; and respect for human rights and fundamental freedoms, including the right to development and gender equality. Although much remains to be done to make these policy objectives a reality, Africa (both its governments and its people) is committed to a bright future that is more prosperous.

Sustainable development

The negative impact of climate change on economic growth and sustainable development in Africa – which in turn is simultaneously limiting the ability of African countries to cope with climate change – will be the continent's priority for the coming decades. Coping with climate variability is a major challenge for the people of SSA. The high dependence of the economies and rural people of the region on rain-fed agriculture, the prevalence of poverty and food insecurity, and the limited development of institutional and infrastructural capacities in this region make coping with natural climate variability a perennial challenge. In the past several decades the number of extreme weather events in particular sub-regions and the number of people affected by droughts and floods have grown dramatically.

The term 'drought' may refer to a meteorological drought (precipitation well below average), hydrological drought (low river flows and low water levels in rivers and lakes, and of groundwater), agricultural drought (low soil moisture), and environmental drought (a combination of the above).³⁵ The socio-economic impacts of droughts may arise from the interaction between natural conditions and human factors such as changes in land use, land cover, and the demand for and use of water. Excessive water withdrawals can also exacerbate the impact of droughts.

The challenge is being magnified by global climate change in most of SSA. According to most models, mean rainfall is predicted to decline in many parts of the region, especially in Southern Africa, while rainfall is more likely to increase in parts of eastern and central Africa and more extreme weather events are predicted.³⁶

According to the World Bank's development report for 2010, the need is for Africa to ensure that the current development impacts of climate change on its economies and populations are recognised and that a development agenda is integrated into climate negotiations.³⁷ All African countries face the global climate change challenge, which threatens their development gains and prospects.³⁸

Ultimately, Africa needs sustainable development, including a rapid move toward a low-carbon economy. New green growth investment opportunities are necessary to respond to the urgent and growing need for climate change adaptation. Development that can be sustained in a world changed by climate must be enabled by building the adaptive capacity of people and defining appropriate technical adaptive measures.

The productivity and sustainability of Africa's environment are heavily dependent on how climate change is managed. The range of livelihoods, with their opportunities for human development and alleviating extreme poverty and hunger, extend from total dependence on natural resources systems to greater, but not complete, independence from such systems. According to a UN report on development in Africa, the region is failing to keep pace with the rest of the world in terms of development.³⁹ Africa also has the highest proportion of people living in extreme poverty, with a total of 330 million people in this situation in SSA.⁴⁰ Poverty not only makes people vulnerable, but also limits their choices. In addition, natural disasters such as floods can overwhelm poor households, destroying their ability to cope, and if crops fail, subsistence farmers have few or no alternative means to provide food for their families. Over 70 per cent of the people of SSA survive by subsistence agriculture and their livelihoods depend on natural resources.⁴¹

Climate change is ... likely
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and political problems

Africa's variable climate is already contributing significantly to its development problems, and yet government support that would help poor households to adapt to climate change is very limited. The key development sectors of agriculture, water, energy, transport and health are all sensitive to climate variability.⁴² Climate-related disasters – catastrophic floods or prolonged droughts – have enormous social and economic impacts that can negate years of development efforts. The negative impacts of climate change at the household level multiply into

negative impacts on national economies. Climate thus presents a risk to both livelihoods and governments; at the same time, it also presents opportunities that can be exploited.

Africa is not currently benefitting from all that climate science has to offer. Climate information, which feeds into decision making as a matter of course in developed countries, is mostly failing to reach decision makers in useful and useable forms in SSA. A computer-driven weather forecasting tool known as General Circulation Models can be used to understand current climate conditions and project future climate change.⁴³ However, due to a lack of primary data on which to base the model, predicting Africa's climatic changes remains uncertain and the climate-observation system in Africa is in a far worse state than those of other continents and is deteriorating.⁴⁴

CLIMATE CHANGE – ANOTHER SECURITY THREAT FACING AFRICA

Climate change is also another of the many security threats facing Africa, because it is likely to produce a host of social and political problems that are likely to weaken states and societies.⁴⁵ Climate change may thus seriously threaten political and economic stability in Africa. It may also put severe strain on the capacities of state and societies to coordinate activities, to communicate and to organise. This weakening effect is hugely problematic in terms of human security, as it will jeopardise health, livelihoods and development. A decrease in 'interaction capacity' is also likely to decrease the ability of states and other social organisations, such as clans, ethnic groups and criminal networks, to exercise large-scale violence, but this seemingly positive factor will come at too high a price for it to be seen as such.

Climate and environmental disasters that threaten human security can induce forced migration and produce competition among communities and nations for water and basic needs resources, with potential negative consequences for political stability and conflict resolution, e.g. when communities and nations struggle to access scarce water resources or when forced migration puts previously separate groups into conflict over the same resources. Given the history of resource and political conflicts in Africa, climate change could aggravate territorial and border disputes and complicate conflict resolution and mediation processes. Constraints on water availability are a growing concern in Africa, and climate change will exacerbate this situation. Conflicts over water resources will have implications for both food production and people's access to food in conflict zones.⁴⁶

Declining water resources and diminishing arable land are already intensifying competition for these

resources and creating tensions among displaced populations. Armed conflicts and intensified national security concerns minimise the capacity to cope with climate change. An estimated one billion people worldwide could be forced from their homes by 2050, with 250 million of them permanently displaced by the effects of climate change.⁴⁷

Climate change is best viewed as a threat multiplier that exacerbates existing trends, tensions and instability. The core challenge is that climate change threatens to overburden states and regions that are already fragile and conflict prone. It is important to recognise that the risks are not just of a humanitarian nature; they also include political and security risks that directly affect African governments in particular and the global community in general. Moreover, in line with the concept of human security, it is clear that many issues related to the impact of climate change on international security are interlinked, requiring comprehensive policy responses.

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CLIMATE CHANGE AND THE AU POSITION

As one of the most vulnerable regions in the world to the projected impacts of climate change, Africa faces many challenges at this critical juncture. Traditionally, national development plans, poverty reduction strategy papers and sectoral strategies in climate-sensitive sectors have paid little, if any, attention to climate variability, and even less to climate change. Africa's ability to turn a threat into an opportunity hinges on actions taken today.

Africans have already begun to take some steps in their region. For example, the African Union Commission (AUC) supported the Environment Initiative of the New Partnership for Africa's Development (NEPAD) and its related Action Plan, acknowledging the economic importance of climate variability and change by including a programme area on combatting climate change in Africa. In addition, the AUC-supported NEPAD Africa Regional Strategy for Disaster Risk Reduction recognises the importance

of coordination across agencies for proactive disaster prevention and response strategies.⁴⁸

In addition, the AUC, in partnership with the UN Economic Commission for Africa and the African Development Bank, is supporting a major new initiative, the Global Climate Change Observing System-Africa Climate for Development, which began in 2007.⁴⁹ The programme is designed to integrate climate information and services into development in support of Africa's progress towards the MDGs. A major objective is to mainstream climate information in national development programmes, focusing initially on the most climate-sensitive sectors.

Moreover, the recent decisions taken by African leaders at the AU Summit and the African Partnership Forum/UN Economic Commission for Africa Special Session on Climate Change, the establishment of the African Centre on Climate Policy and the statement by the AU spokesperson at the Summit on Climate Change during the session of the UN General Assembly in New York show that Africa's political leadership is sufficiently aware of the threats of climate change. African leaders are united about the need for adaptation and mitigation strategies to cope with the effects of climate change on Africa's development.

Speaking at the opening proceedings, Jean Ping, chairperson of the AUC, said Africa suffers most from a problem that it has not created.⁵⁰ He further commented that Africa is already suffering from the severe effects of climate change; we all must urgently seek solutions. The AU, as a lead Pan-African institution, regards climate change as a very critical issue and attaches great importance to it. Several decisions relating to climate change have been taken recently at the level of African heads of state and government. On the occasion of the Twelfth Ordinary Session of the Assembly of Heads of State and Government of the AU held in Addis Ababa in February 2009 it was decided that the ongoing climate change negotiations should give Africa an opportunity to demand compensation for the damage caused to its economy due to global warming.⁵¹

The AUC continues to steer efforts of AU member states and regional economic communities, as well as other stakeholders, to deal with multiple challenges facing them, including climate change. African countries should proactively join the international community in combatting climate change, given its devastating effects. Although individual states have already taken positive steps by ratifying or acceding to the UNFCCC and the Kyoto Protocol, it is high time that the AU also acceded to these agreements, thereby bolstering the efforts of individual states. As of 11 April 2007, 195 states and one regional economic organisation (i.e. the European Economic Community) had ratified the UNFCCC.⁵²

One hundred and eighty-four parties of the convention (including the European Economic Community) have ratified the Kyoto Protocol to date, and, of these, fifty are African countries.⁵³ The Kyoto Protocol is open to accession only by parties to the UNFCCC. This means that the AU would have to first ratify the UNFCCC before ratifying the Kyoto Protocol.

Africa's concerns and its agenda on environmental change in general and global warming in particular are totally ignored by developed nations, which are the main actors affecting the global environment. Indeed, Africa has tried to present its case and pleas to the international communities and governments, as well as non-governmental institutions, on the dire present and future consequences of climate change on Africa. The African voice that was individually presented was not seriously considered. Nevertheless, for the first time in history, Africa forged a common position and formed a single negotiating team empowered to negotiate and represent all the member states of the AU at the global talks that took place in December 2009 in Copenhagen.

Africa contributes little to
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of climate change

The AU was mandated to work out the modalities of such representation. The first meeting of the Conference on Climate Change that convened on 31 August 2009 in Tripoli adopted a negotiating process, structure and coordination mechanism for Africa's common position on global climate change negotiations. A number of decisions related to climate change were also taken during the Thirteenth Ordinary Session of the Assembly of the AU in July 2009 in Sirte, Libya.⁵⁴ The AUC has been given a clear mandate to forge ahead with the implementation of the climate change programme, in partnership with other strategic institutions. It was also decided to establish a Conference of African Heads of State and Governments on Climate Change, as well as to set up a unit to deal with climate change at the AUC. Finally, the AU became a state party to the UNFCCC and Kyoto Protocol.⁵⁵ In addition, during the Twelfth African Ministerial Conference on the Environment in June 2008 the conference proposed that Africa should seek agreement on a future global emissions reduction

regime under which all developed countries would by 2020 reduce their emissions to 35–40 per cent below 1990 levels, and by 2050 cut emissions to targets that are what is believed to be necessary to stabilise the concentration of carbon dioxide in the atmosphere.⁵⁶

Adaptation to climate change

A number of adaptation options in agriculture face a dilemma. What is adaptation? The UNFCCC provides a clear answer: 'Adaptation is processes through which societies make themselves better able to cope with an uncertain future. Adapting to climate change entails taking the right measures to reduce the negative effects of climate change (or exploit the positive ones) by making the appropriate adjustments and changes.'⁵⁷ The Intergovernmental Panel on Climate Change (IPCC) defines adaptation as '[a]djustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities'.⁵⁸ Adaptation also involves learning to manage new risks and strengthening resilience in the face of change.⁵⁹ As late as April 2007, a report by the IPCC warned that Africa was not acting quickly enough to stem the dire economic and environmental consequences of excessive greenhouse gas emissions.⁶⁰

The Secretariat of the UNFCCC estimates that US\$ 220 million per year will be required by African countries to adapt to climate change by the year 2030.⁶¹ According to Article 4 (4) of the UNFCCC, developed countries are under a legal obligation to provide financial resources to African countries to adapt to climate change.⁶² Although there are some proposals for funding for adaptation measures through the Global Environment Facility; the Adaptation Fund; the Least Developed Countries Fund; the Special Climate Change Fund; and bilateral, regional and other multilateral channels, the proposed measures need to be significantly scaled up to match the challenge of adaptation to climate change in Africa. Africa should aggressively demand that developed countries meet the cost of adaptation to climate change in Africa.

It has been argued that developed countries, whose greenhouse gas emissions are largely responsible for climate change, should provide financial resources to Africa to adapt to climate change. Africa contributes little to greenhouse gas emissions, but will seriously suffer from the undesirable impacts of climate change. Therefore, Africa should be compensated for the damages caused to its development prospects by global warming. This in line with the 'polluter pays' principle, since it is owed not as aid from developed countries to Africa, but as compensatory finance from high-emission countries

to those most vulnerable to the impacts of climate change. Such compensation should not only be adequate, predictable and accessible, but also must come from clearly identifiable sources, and should be administered by an entity in which Africa plays a role consistent with its numbers.

Climate change will exacerbate poverty unless vulnerable populations, particularly the poorest in Africa, are assisted in building climate-resilient livelihoods. This will require the following:

- Adaptation measures: including water-wise irrigation systems, low-/no-till agricultural practices, income diversification and disaster risk management
- Initiatives to help small farmers and other vulnerable groups to protect and promote agricultural production, including improving agricultural extension services so as to increase yields and the establishment of independent networks of information exchange between and among communities across the region
- The empowerment of women and other marginalised social groups to overcome the additional barriers they face to adaptation
- Inclusive, transparent and accountable adaptation planning with the effective participation of especially vulnerable populations across the continent

In regard to agricultural production and water, climate adaptation may include the following:

- The adoption of varieties and species of crops with increased resistance to heat stress, shocks and drought
- The modification of irrigation techniques, including amount, timing or technology (e.g. the drip irrigation system)
- The adoption of water-efficient technologies to 'harvest' water, conserve soil moisture, and reduce siltation and saltwater intrusion
- Improved water management to prevent water logging, erosion and nutrient leaching
- The modification of crop calendars, i.e. the timing and location of cropping activities
- The integration of the crop, livestock, forestry and fishery sectors at farm and catchment levels
- The implementation of seasonal climate forecasting
- Additional adaptation strategies involving land-use changes that take advantage of modified agro-climate conditions.

Mitigation of climate change and capacity building

The quality of the environment continues to decline in many parts of Africa: the continent's last great forests

are fast disappearing; rangelands in the Sahel are rapidly being turned into desert; and there seem to be few, if any, parts of the continent that are immune to this general trend of decline. Actions aimed at alleviating the consequences of deforestation and forest degradation have been considered in future positive-incentive mechanisms for emissions reduction, taking into account the role of forested areas in the regulation of the global climate system, as well as the beneficiaries of land development efforts to ensure the maintenance of forest areas and the implementation of sustainable agriculture.⁶³ In addition, deforestation caused by illegal logging, the felling of trees for firewood and charcoal for cooking, and 'slash and burn' farming practices have reduced biodiversity in Africa and weakened the continent's ability to adapt to climate change. The major portion of carbon dioxide release in Africa is contributed by burning fossil fuels and the conversion of tropical forests to facilitate agricultural production, as well as lumber cutting for domestic and international industry. Yet this situation reflects the reality of energy insecurity in Africa in terms of increasing demand due to population growth and dwindling supplies of traditional fossil fuels.

Heavy reliance on non-renewable fuel sources for domestic energy supply in most of SSA contributes to ecosystem degradation, which is threatening wildlife and endangered species, and destroying natural forests. African countries need to urgently build capacity at all levels to respond to the challenge of climate change. Capacity building is urgently required in the areas of human resource expertise in climate science and institutional frameworks. Capacity-building frameworks under the international negotiation process are intended to serve as a guide for the climate change capacity-building activities of funding bodies.

Financial mechanisms

Developed countries are under an obligation to provide financial resources to assist African countries to implement the UNFCCC. In this respect, a financial mechanism to provide funds to developing countries has been established.⁶⁴ Despite the existence of this mechanism, limited financial resources have been made available to Africa. Three main issues must be managed to get adaptation financing right, i.e. the mobilisation, management and allocation of resources.

There is therefore a need for Africa to aggressively push for a review of this financial mechanism to pave the way for the provision of financial assistance to African countries to address the climate change challenge. In addition, a compensation fund should be established and allocated to African countries on the basis of clear criteria, particularly each country's need for compensation

and the country plans in which adaptation measures should be incorporated.

The AU, UNFCCC and Kyoto Protocol

The AU has recognised the need to encourage its member states to become state parties to the UNFCCC and the Kyoto Protocol in order for the AU to effectively negotiate in future rounds of negotiations in its own right. This will be in addition to ratification by individual AU member states. Since August 2007 about 50 African countries have already become parties to the UNFCCC and Kyoto Protocol.⁶⁵ The negotiating structure proposed for the UNFCCC/Kyoto Protocol negotiations process is a negotiation team composed of a Conference of African Heads of State on Climate Change comprising Algeria, Republic of Congo, Ethiopia, Mauritius, Mozambique, Nigeria and Uganda; and a team of Negotiators/Experts on Climate Change from all member states who are country parties.⁶⁶

On the other hand, one has to realise that the existing adaptation mechanisms and resources under the Kyoto Protocol designed to mitigate climate change's effects on Africa (and other developing regions) have been directed at limiting future carbon emissions rather than addressing the region's vulnerability and lack of resilience to the impact of climate change on its economies and populations. What are missed in the Kyoto Protocol are the facts and links between climate change and droughts, desertification, floods, coastal storms and soil erosion – contemporary disaster events that threaten lives and livelihoods and hinder Africa's economic growth and social progress.

Irrigation ... can also
provide a base for growth,
income and employment
in disfavoured rural areas

The AUC, through convening preparatory and consultative meetings, has mobilised all African negotiators on climate change with the aim of implementing a common negotiating position on key climate change issues. The commission has also embarked on the development of a comprehensive strategy on climate for Africa. However, more needs to be done and the AUC needs to act aggressively in terms of creating a specialised unit on climate change and desertification control, which will strengthen its capacity to be more informed

on climate change trends and to adequately plan and be better prepared to support AU member states in undertaking mitigation and adaptation measures on the continent. It will also enhance partners' coordination and the implementation of climate change activities on the continent in accordance with national, regional and international obligations.

CONCLUSION, RECOMMENDATIONS AND A WAY FORWARD

Although for the large part developed nations are responsible for climate change and have contributed most to global emissions, it is poorer people in Africa who will suffer the most and pay the price for the catastrophic impacts of climate change. Moreover, the impact of climate change on broader human security and poverty could be very significant, as so many African livelihoods are dependent on rain-fed agriculture. Climate change is intensifying water scarcity in Africa. As demand for water hits the limits of finite supply, potential conflicts are brewing across the continent.

The risks of violent conflict in countries where populations live in fragile and unstable conditions that make them vulnerable to climate change effects are real. As pressure for freshwater supplies rises due to climate change, pollution, access to water, and its allocation and use are becoming increasingly critical concerns that may have profound consequences for societal stability in Africa. Many countries in eastern Africa may soon be caught up in water disputes unless they move quickly to establish agreements on how to share reservoirs, rivers and underground water aquifers. Water, essential for human survival, is also necessary for nearly every sector of human activity, including agriculture, industrial production and power generation, and is a key means for transporting people and goods. In addition, water often has a substantial emotional and symbolic value, and is also needed for keeping natural ecosystems intact.

Recommendations

While irrigation stands out as a measure for improving agricultural productivity, it can also provide a base for growth, income and employment in disfavoured rural areas, thereby mitigating one cause of rural–urban migration. Also, the need becomes apparent to address the issue of alternative energy such as solar, hydro and wind power to mitigate the current problem of deforestation, overgrazing, drought and soil degradation in many parts of Africa.

Environmental change may very well be capable of forcing migration. Deforestation for cultivation, construction timber and wood fuel has accelerated

rural–urban migration in Africa, which in turn has contributed to poor electricity and power supplies, pollution, lack of clean water, few employment opportunities, poor education and health provision, poor sewerage systems and lack of shelter in the continent's cities. In this context, reducing emissions from deforestation and degradation offers a promising mechanism for simultaneously delivering mitigation, adaptation and economic benefits while sustaining vital ecosystem services in rural Africa.

If widely adopted, adaptation strategies in agricultural production systems have a substantial potential to offset negative climate change impacts and can even take advantage of positive ones, while reversing the current trend of rural–urban migration in Africa. Furthermore, environmental information and awareness should aim at increasing public awareness and understanding of the community of interest and the common eco-system that the environment creates. The effect is enhanced when educational institutions are included in awareness-raising activities. Activities should especially target future generations in African countries by providing environmental education to the general public, primary and secondary schools, and universities.

Moreover, the mass media have a vital, but so far largely neglected, role to play in climate change issues in Africa. They can communicate with the general public and local communities, both raising awareness of climate issues generally and when specific threats arise by conveying the risks and the recommended responses. Radio is still the most effective way of reaching rural stakeholders in SSA, but new information and communication technologies should be explored as well.

Moreover, the AUC should continue to lead efforts of AU member states and regional economic communities, as well as other stakeholders, to deal with the multiple challenges associated with climate change. Finally, it is up to individual African countries to proactively join the international community in combatting climate change, given its devastating impacts.

In conclusion, climate change is already affecting people across Africa and will wipe out efforts to tackle poverty unless urgent actions are taken now in terms of adaptation, mitigation and compensation. Failure to reach an equitable agreement on climate change negotiations may have dire consequences for Africa in particular and the world in general. Furthermore, climate change is a serious global challenge that demands urgent, cooperative, fair and shared responsibility to act. To achieve effective cooperation in terms of climate change issues, it will be important to involve key stakeholders from the climate change community where they are not yet involved.

The December 2009 Copenhagen talks on climate change and the uncertainty that followed offered a powerful and sobering illustration of how far the world's governments are from negotiating a binding treaty to deal with climate change. Those who believe that a robust and binding climate framework is essential have been left depressed and demoralised. Many now fear that a global governance system that is unable to respond to the greatest threat of the 21st century could, in fact, be broken.

A way forward

Without urgent action, climate change will exacerbate conflict and natural disasters and impede development projects in Africa. The world's governments not only have a responsibility to work constructively for a global agreement to manage climate change, but should also provide an enabling policy framework covering management, planning and service delivery functions for adaptation that facilitate and support local institutions and other actors' efforts. They should also ensure that devolved administrative responsibilities are matched by resources and technical capacity. In addition, African governments need to invest more in climate and meteorological information; biophysical monitoring; and early warning, preparedness and response mechanisms, and integrate such data into their planning. Climate change can offer new opportunities for productive and sustainable land management practices, such as reforestation, improved water management, integrated soil fertility management, conservation agriculture, agro forestry and improved rangeland management.

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ANNEXURE 1 – THE 1997 KYOTO PROTOCOL

The 1997 Kyoto Protocol, which went into effect in 2005, is the major global warming treaty currently in force. Under the treaty, the nations of Europe, Japan, Canada, and most other developed countries committed themselves to reducing greenhouse emissions – mainly carbon dioxide from fossil fuels – which are to blame for global warming. Generally, these nations are supposed to reduce emissions by 5 per cent below 1990 baseline levels by 2012. The US has not ratified the treaty. China, India and other developing countries have ratified it, but are exempted from any obligation to reduce emissions. Notwithstanding the seriousness of global warming, the Kyoto Protocol has failed to reduce greenhouse gas emissions and has had no effect on global warming.

ANNEXURE 2 – UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC)

The United Nations Framework Convention on Climate Change (UNFCCC) was adopted on 9 May 1992 by the Intergovernmental Negotiating Committee established for its negotiation. In June 1992 the UNFCCC was opened for signature. It entered into force on 21 March 1994. By August 2005, the UNFCCC had 197 State Parties, making it one of the most universally-supported multilateral environmental agreements.

Objective and approach

The ultimate objective of the Convention is to achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

All Parties to the UNFCCC are subject to general commitments to respond to climate change. They are required to compile an inventory of their greenhouse gas emission and submit reports, known as national communications, on actions they are taking to implement the Convention. These reports provide the means to monitor progress made by Parties in meeting their commitments and in achieving the Convention's ultimate objective.

To focus their actions, Parties to the UNFCCC must prepare national programmes containing climate change mitigation measures, provisions for developing

and transferring environmentally friendly technologies, provisions for sustainably managing carbon sinks, preparations to adapt to climate change, plans for climate research, observation of the global climate system and data exchange, and plans to promote education, training and public awareness relating to climate change.

Apart from these general commitments, the UNFCCC divides countries into three main groups that are subject to different types of commitments.

Annex I Parties, i.e., industrialized countries that were members of the Organisation for Economic Co-operation and Development (OECD) in 1992, and countries with economies in transition (*EIT Parties*) are required to adopt climate change policies and measures with the aim of reducing greenhouse gas emissions to 1990 levels by 2000. They are expected to take the lead in dealing with climate change and must report more often and in greater detail than non-Annex I Parties. The EIT Parties within the Annex I group are given “flexibility” in implementing their commitments, e.g. to select a baseline year other than 1990 for their specific commitments.

Annex II Parties, the OECD members within the Annex I group, have special responsibilities in relation to providing financial resources to enable developing countries to undertake emission reduction activities under the UNFCCC and to help them adapt to the adverse effects of climate change. They are also urged to promote the development and transfer of environmentally friendly technologies to EIT Parties and developing countries.

Non-Annex I Parties are mainly developing countries. Within this group are subsets of countries recognized by the UNFCCC as being especially vulnerable to climate change or to the potential economic impacts of climate change response measures. The 48 Parties classified by the United Nations as least developed countries (LDCs) are given special consideration under the UNFCCC due to their limited capacity to respond to climate change and adapt to its adverse effects. Non-Annex I Parties have no quantitative obligations under the UNFCCC. Submission of their national communications is tied to funding received to cover their reporting costs. LDCs can submit their national communications at their discretion.

To respond to the needs of the most vulnerable countries, the UNFCCC has provisions on investment, insurance and technology transfer.

To supplement other available funding mechanisms, special funds have been created under the UNFCCC, namely:

- **A Special Climate Change Fund (SCCF)** that exists to finance projects relating to capacity-building, adaptation, technology transfer, climate change

mitigation and economic diversification for countries highly dependent on income from fossil fuels

- A **Least Developed Countries Fund** (LDC Fund) intended to support a special work programme to assist LDCs

Institutional structure

Conference of the Parties (COP): This is the supreme body of the UNFCCC, tasked to review the implementation of the UNFCCC, adopt decisions to further develop the UNFCCC's rules, and negotiate new commitments. The COP currently meets annually.

Subsidiary Body for Scientific and Technological Advice (SBSTA): SBSTA provides advice to the COP on matters of science, technology, and methodology, including guidelines for improving standards of national communications and emission inventories. SBSTA meets at least twice a year, with its last sessions of the year being held in conjunction with the sessions of the COP.

Subsidiary Body for Implementation (SBI): SBI helps the COP to assess and review the UNFCCC's implementation and deals with financial and administrative matters. SBI sessions are held at the same time as SBSTA sessions.

Secretariat: The secretariat is responsible for supporting all the institutions involved in the climate change process, particularly the COP, the subsidiary bodies and their Bureaux. It makes arrangements for sessions of the UNFCCC bodies, helps Parties to fulfill their commitments, compiles and disseminates data and information, and confers with other relevant international agencies and treaties. It is based in Bonn, Germany.

Financial mechanism: The Global Environment Facility (GEF) operates the UNFCCC's financial mechanism, which channels funds to developing countries on a grant or loan basis, including funds received from Annex II Parties. The GEF reports on its climate change work to the COP every year. As part of the Marrakesh Accords agreed to at COP 7 (Marrakesh, Morocco, 2001), the GEF expanded the scope of activities eligible for funding, including work on adaptation and capacity-building. The GEF manages the SCCF and the LDC Fund.

Expert Groups: The LDC Expert Group, established in 2001, supports LDCs in the preparation of their national adaptation programmes of action. The Consultative Group of Experts on National Communications from Parties not included in Annex I to the Convention (CGE) was established in 1999 to look into ways to improve national communications prepared by non-Annex I Parties. At least one member of the CGE from LDC Parties and at least one member of the CGE from Annex II Parties must be members of the LDC Expert Group. The LDC Expert Group and CGE

report to SBI, which then makes recommendations to the COP. An Expert Group on Technology Transfer (EGTT) was established in 2001 to oversee implementation of the framework for meaningful and effective actions on technology transfer and to identify ways of advancing activities in this area. The EGTT makes recommendations to SBSTA which can then forward them to the COP.

The Intergovernmental Panel on Climate Change (IPCC): The IPCC, an independent institution created by the World Meteorological Organization and the United Nations Environment Programme, works with the UNFCCC and is a crucial source of information on climate change. It publishes a comprehensive progress report on the state of climate change science every five years, as well as Special Reports or Technical Papers on specific issues at the request of the COP or SBSTA.

Work areas of the Convention

The Buenos Aires Programme of Work on Adaptation and Response Measures, adopted at COP 10 (Buenos Aires, Argentina, 2004) emphasizes implementation of activities identified in the context of national communications and foresees further action on vulnerability and adaptation as well as information gathering and methodologies.

Capacity building activities are guided by two decisions adopted at COP 7, namely the Framework for Capacity Building in Developing Countries and the Framework for Capacity Building in Countries with Economies in Transition. These frameworks emphasize that capacity building should be country-driven, involve learning-by-doing, and build on existing national and bilateral activities.

To increase and improve the transfer and access to environmentally sound technologies and know-how, the Framework for Meaningful and Effective Actions to Enhance the Implementation of Article 4, Paragraph 5, of the Convention (on technology transfer) was adopted at COP 7.

At COP 8 (New Delhi, India, 2002), a five-year New Delhi Work Programme on Article 6 of the Convention (education, training and public awareness) was adopted. The Work Programme defines the scope of possible activities at national and international levels, encourages the spread and exchange of information and promotes partnership and networking efforts. International partnerships and synergies figure prominently in the work programme.

The centerpiece of work with the LDCs is the preparation of national programmes of action (NAPAs) that are intended to communicate priority activities addressing the urgent and immediate needs and concerns of LDCs relating to adaptation to the adverse effects of climate change. NAPAs are to be prepared in accordance

with the Guidelines for the Preparation of National Adaptation Programmes of Actions adopted at COP 7.

Source: <http://www.tematea.org/?q=node/11> (accessed July 2010).



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ABOUT THIS PAPER

This paper is concerned with the fact that African nations are among the lightest polluters, yet analysts say they will suffer the most from climate change in their pursuit of water and food security, sustainable development, and political and economic sustainability. Therefore the paper reviews the relationships among climate change, water and food security, conflicts, and development. It also argues that there is a need for climate change information in Africa and reviews the status of international climate agreements related to adaptation, mitigation and compensation. In addition, the paper argues that even if climate change by its nature may not necessarily lead to violent inter-state conflicts, scarcity of water and food in Africa has already nurtured political tensions among nations, thus retarding efforts towards sustainable development.

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